



## SEQUENCE LISTING

&lt;110&gt; BRILES et al.

<120> PNEUMOCOCCAL SURFACE PROTEIN C (PSPC), EPITOPIC REGIONS  
AND STRAINS THEREOF AND USES THEREFOR

&lt;130&gt; 454312-3140

&lt;140&gt; 09/298,523

&lt;141&gt; 1999-04-23

&lt;160&gt; 78

&lt;170&gt; PatentIn Ver. 2.1

&lt;210&gt; 1

&lt;211&gt; 691

&lt;212&gt; PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 1

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Thr	Gln	Asn	Val	Asn	Leu	Asn	Arg	Lys	Leu	Ser	Ala	Ile	Gln	Thr	Lys
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Glu	Glu	Ala	Lys	Arg	Lys	Ala	Glu	Glu	Ser	Glu	Lys	Lys	Ala	Ala	Glu	245	250	255	
Ala	Lys	Gln	Lys	Val	Asp	Thr	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Arg	Arg	260	265	270	
Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	275	280	285	
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Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu	Leu	Ser	Val	Leu	Lys	Glu	Asn	355	360	365	
Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys	Thr	Lys	Ala	Glu	Leu	Thr	Ala	370	375	380	
Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Pro	Glu	Lys	Lys	Val	385	390	395	400
Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Lys	Asp	405	410	415	
Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	420	425	430	
Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Lys	Ala	Glu	435	440	445	
Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu	Ser	Arg	Asn	Glu	Glu	Lys	450	455	460	
Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	465	470	475	480
Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	485	490	495	
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Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Asp	Leu	340	345	350	
Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	355	360	365	

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 Ala Lys Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu  
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Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Ala	Lys	Val
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Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp
			340					345					350		
Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp
			355				360					365			
Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Thr
			370			375					380				
Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	Glu	Lys	Pro	Ala	Glu	Gln	Pro
385					390					395					400
Lys	Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln	Ala	Glu	Glu	Asp	Tyr	Ala	Arg
				405					410					415	
Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	Thr	Gln	Gln	Gln	Pro	Pro	Lys

420

425

430

Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr  
 435 440

&lt;210&gt; 6

&lt;211&gt; 481

&lt;212&gt; PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 6

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
 1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly  
 20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr  
 35 40 45

Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val  
 50 55 60

Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg  
 65 70 75 80

Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile  
 85 90 95

Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys  
 100 105 110

Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu  
 115 120 125

Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala  
 130 135 140

Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu  
 145 150 155 160

Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu  
 165 170 175

Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu  
 180 185 190

Val Lys Glu Glu Ala Lys Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln  
 195 200 205

Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu  
 210 215 220

Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys  
 225 230 235 240



Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly  
20 25 30  
Gly Val Val His Ala Glu Gly Val Arg Ser Glu Asn Thr Pro Lys Val  
35 40 45  
Thr Ser Ser Gly Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu  
50 55 60  
Asp Arg Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Ile Ser  
65 70 75 80  
Ala Ile Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys  
85 90 95  
Ser Lys Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala  
100 105 110  
Phe Glu Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala  
115 120 125  
Glu Ala Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln  
130 135 140  
Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu  
145 150 155 160  
Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu  
165 170 175  
Glu Leu Val Lys Glu Glu Ala Lys Glu Phe Arg Asn Glu Gly Thr Ile  
180 185 190  
Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg  
195 200 205  
Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys  
210 215 220  
Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln  
225 230 235 240  
Pro Gln Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro  
245 250 255  
Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln  
260 265 270  
Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu  
275 280 285  
Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr  
290 295 300  
Pro Lys Thr  
305

<210> 8  
 <211> 434  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 8  
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
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 Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly  
           20                  25                  30  
 Gly Val Val His Ala Glu Gly Val Arg Ser Glu Asn Thr Pro Lys Val  
           35                  40                  45  
 Thr Ser Ser Gly Asp Glu Val Asp Glu Tyr Ile Lys Lys Met Leu Ser  
       50                  55                  60  
 Glu Ile Gln Leu Asp Lys Arg Lys His Thr His Asn Phe Ala Leu Asn  
   65                  70                  75                  80  
 Leu Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Tyr Lys Leu Lys Val  
           85                  90                  95  
 Asn Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Thr Ser Lys Thr Lys  
           100                  105                  110  
 Lys Glu Val Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Leu Lys  
       115                  120                  125  
 Leu Gly Glu Lys Val Ala Glu Ala Gln Lys Lys Val Glu Glu Ala Lys  
       130                  135                  140  
 Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr  
   145                  150                  155                  160  
 Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys  
           165                  170                  175  
 Leu Lys Glu Ala Glu Leu Glu Leu Lys Glu Glu Ala Lys Thr Arg  
       180                  185                  190  
 Asn Glu Asp Thr Ile Asn Gln Ala Lys Ala Lys Val Lys Ser Glu Gln  
       195                  200                  205  
 Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Gln Ala  
       210                  215                  220  
 Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys Ala Glu  
   225                  230                  235                  240  
 Glu Ala Lys Arg Lys Ala Glu Ala Glu Glu Val Lys Asp Lys Leu Lys  
           245                  250                  255  
 Arg Arg Thr Lys Arg Ala Val Pro Gly Glu Pro Ala Thr Pro Asp Lys

260					265					270					
Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr
		275					280					285			
Leu	Pro	Ser	Pro	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	Glu	Ala	Gln
		290					295					300			
Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu
				310								315			320
Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Asp	Leu	Glu
				325					330					335	
Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro
				340					345					350	
Gln	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Glu	Lys	Pro	Thr	Glu	Glu	Pro	Glu
				355					360					365	
Asn	Pro	Ala	Pro	Ala	Pro	Lys	Pro	Glu	Asn	Pro	Ala	Pro	Lys	Pro	Glu
				370					375					380	
Asn	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Pro	Ala	Asp	Gln	Gln	Ala
				385					390					395	400
Glu	Glu	Asp	Tyr	Ala	Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	Thr
				405					410					415	
Gln	Gln	Gln	Pro	Pro	Lys	Thr	Glu	Lys	Pro	Ala	Gln	Pro	Ser	Thr	Pro
				420					425					430	

Lys Thr

<210> 9

<211> 487

<212> PRT

<213> Streptococcus pneumoniae

<400> 9

Met	Phe	Ala	Ser	Lys	Asn	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys
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Phe	Ser	Ile	Gly	Val	Ala	Ser	Val	Ala	Val	Ala	Ser	Leu	Phe	Met	Gly
			20					25					30		

Ser	Val	Val	His	Ala	Thr	Glu	Lys	Glu	Val	Thr	Thr	Gln	Val	Ala	Thr
			35				40					45			

Ser	Phe	Asn	Lys	Ala	Asn	Lys	Ser	Gln	Thr	Glu	His	Met	Lys	Ala	Ala
	50					55					60				

Lys	Gln	Val	Asp	Glu	Tyr	Ile	Thr	Lys	Lys	Leu	Gln	Leu	Asp	Arg	Arg
65						70				75					80



Lys	His	Thr	Gln	Asn	Val	Gly	Leu	Leu	Thr	Lys	Leu	Gly	Val	Ile	Lys	
				85					90					95		
Thr	Glu	Tyr	Leu	His	Arg	Leu	Ser	Val	Ser	Lys	Glu	Lys	Ser	Glu	Ala	
			100					105					110			
Glu	Leu	Pro	Ser	Glu	Ile	Lys	Ala	Lys	Leu	Asp	Ala	Ala	Phe	Glu	Gln	
		115					120					125				
Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Gly	Lys	Lys	Val	Ala	Glu	
	130					135					140					
Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	
145					150					155					160	
Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	
				165					170					175		
Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	
			180					185					190			
Leu	Val	Lys	Glu	Glu	Ala	Lys	Gly	Ser	Arg	Asn	Glu	Gln	Lys	Val	Asn	
		195					200					205				
Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	
	210					215					220					
Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Gln	Ala	Glu	Thr	Thr	Arg	Leu	Glu	
225					230					235					240	
Asn	Ile	Lys	Thr	Asp	Arg	Glu	Lys	Ala	Glu	Glu	Ala	Lys	Arg	Lys	Ala	
				245					250					255		
Asp	Ala	Lys	Glu	Gln	Asp	Glu	Ser	Lys	Arg	Arg	Val	Lys	Gly	Gly	Val	
			260					265					270			
Pro	Gly	Glu	Gln	Ala	Thr	Leu	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	
		275					280					285				
Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys	
	290					295					300					
Ser	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	
305					310					315					320	
Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	
				325					330					335		
Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	
			340					345					350			
Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	
		355					360					365				
Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu	Ser	Lys	
	370					375					380					

Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys  
 385 390 395 400  
 Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Ser Glu Lys Val Lys Glu  
 405 410 415  
 Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys  
 420 425 430  
 Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala  
 435 440 445  
 Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr Ala Arg Arg Ser  
 450 455 460  
 Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu  
 465 470 475 480  
 Lys Pro Ala Gln Pro Ser Thr  
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<210> 10  
 <211> 483  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 10  
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
 1 5 10 15  
 Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly  
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 Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr  
 35 40 45  
 Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val  
 50 55 60  
 Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg  
 65 70 75 80  
 Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile  
 85 90 95  
 Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys  
 100 105 110  
 Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu  
 115 120 125  
 Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala  
 130 135 140  
 Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu  
 145 150 155 160

Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	165	170	175
Glu	Ile	Ala	Glu	Phe	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	180	185	190
Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys	Gln	195	200	205
Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	210	215	220
Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	225	230	235
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Asn	Val	Ala	Thr	Ser	Asp	Gln	Gly	245	250	255
Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	260	265	270
Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	275	280	285
Glu	Glu	Thr	Leu	Pro	Ser	Ser	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	290	295	300
Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	305	310	315
Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	325	330	335
Asp	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	340	345	350
Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Thr	355	360	365
Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	370	375	380
Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	385	390	395
Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	405	410	415
Pro	Gln	Pro	Ala	Pro	Ala	Thr	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	420	425	430
Glu	Lys	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln	435	440	445
Ala	Glu	Glu	Asp	Tyr	Ala	Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	450	455	460

Ile Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Phe Thr  
 465 470 475 480

Pro Lys Thr

<210> 11

<211> 329

<212> PRT

<213> Streptococcus pneumoniae

<400> 11

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
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Phe Ser Val Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly  
 20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ala Thr Gln Val Pro Thr  
 35 40 45

Ser Ser Asn Arg Ala Asn Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro  
 50 55 60

Lys Lys Leu Asp Ser Glu Arg Asp Lys Ala Lys Thr Ala Val Ser Glu  
 65 70 75 80

Tyr Lys Glu Lys Lys Val Ser Glu Ile Tyr Thr Lys Leu Glu Arg Asp  
 85 90 95

Arg His Lys Asp Thr Val Asp Leu Val Asn Lys Leu Gln Glu Ile Lys  
 100 105 110

Asn Glu Tyr Leu Asn Lys Ile Val Gln Ser Thr Ser Lys Thr Glu Ile  
 115 120 125

Gln Gly Leu Ile Thr Thr Ser Arg Ser Lys Leu Asp Glu Ala Val Ser  
 130 135 140

Lys Tyr Lys Lys Ala Pro Ser Ser Ser Ser Ser Gly Ser Ser Thr  
 145 150 155 160

Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Leu  
 165 170 175

Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys Lys  
 180 185 190

Lys Ala Lys Asp Gln Lys Glu Glu Asp Tyr Arg Asn Tyr Pro Thr Ile  
 195 200 205

Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val  
 210 215 220

Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg

225		230		235		240									
Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Glu	Glu
				245					250					255	
Thr	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala
			260					265					270		
Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu
		275					280					285			
Lys	Pro	Ala	Glu	Gln	Gln	Ala	Glu	Glu	Asp	Tyr	Ala	Arg	Arg	Ser	Glu
	290					295					300				
Glu	Glu	Tyr	Asn	Arg	Leu	Thr	Gln	Gln	Gln	Pro	Pro	Lys	Thr	Glu	Lys
305					310					315					320
Pro	Ala	Gln	Pro	Ser	Thr	Pro	Lys	Thr							
				325											

<210> 12  
 <211> 513  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 12

Met	Phe	Ala	Ser	Lys	Ser	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys
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Phe	Ser	Val	Gly	Ala	Ser	Val	Val	Val	Ala	Ser	Leu	Val	Met	Gly	Ser
			20					25					30		
Val	Val	His	Ala	Thr	Glu	Asn	Glu	Gly	Ala	Thr	Gln	Val	Pro	Thr	Ser
		35					40					45			
Ser	Asn	Arg	Ala	Asn	Glu	Ser	Gln	Ala	Glu	Gln	Gly	Glu	Gln	Pro	Lys
	50					55					60				
Lys	Leu	Asp	Ser	Glu	Arg	Asp	Lys	Ala	Arg	Lys	Glu	Val	Glu	Glu	Tyr
65					70					75					80
Val	Lys	Lys	Ile	Val	Gly	Glu	Ser	Tyr	Ala	Lys	Ser	Thr	Lys	Lys	Arg
			85						90					95	
His	Thr	Ile	Thr	Val	Ala	Leu	Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	Asn
			100					105					110		
Glu	Tyr	Leu	Asn	Lys	Ile	Val	Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	Gln
		115					120					125			
Ile	Leu	Met	Met	Glu	Ser	Arg	Ser	Lys	Val	Asp	Glu	Ala	Val	Ser	Lys
	130					135					140				
Phe	Glu	Lys	Asp	Ser	Ser	Ser	Ser	Ser	Ser	Ser	Asp	Ser	Ser	Thr	Lys
145					150					155					160

Pro	Glu	Ala	Ser	Asp	Thr	Ala	Lys	Pro	Asn	Lys	Pro	Thr	Glu	Pro	Gly	165	170	175
Glu	Lys	Val	Ala	Glu	Ala	Lys	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Ala	180	185	190
Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	195	200	205
Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	210	215	220
Ala	Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	Asn	Glu	Pro	Arg	Asp	Glu	225	230	235
Gln	Lys	Ile	Lys	Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	245	250	255
Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Glu	Glu	260	265	270
Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Gly	275	280	285
Arg	Ala	Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	290	295	300
Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	305	310	315
Pro	Ser	Pro	Ser	Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	325	330	335
Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	340	345	350
Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	355	360	365
Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	370	375	380
Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	385	390	395
Ala	Glu	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	405	410	415
Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	420	425	430
Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	435	440	445
Pro	Ala	Pro	Lys	Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Lys	Pro	Glu	Asn	450	455	460

Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu  
465 470 475 480

Glu Glu Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Leu  
485 490 495

Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys  
500 505 510

Thr

<210> 13

<211> 511

<212> PRT

<213> Streptococcus pneumoniae

<400> 13

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
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Phe Ser Val Gly Ala Ser Val Val Val Ala Ser Leu Val Met Gly Ser  
20 25 30

Val Val His Ala Thr Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser  
35 40 45

Ser Asn Arg Ala Asn Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys  
50 55 60

Lys Leu Asp Ser Glu Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr  
65 70 75 80

Val Lys Lys Ile Val Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg  
85 90 95

His Thr Ile Thr Val Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn  
100 105 110

Glu Tyr Leu Asn Lys Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln  
115 120 125

Ile Leu Met Met Glu Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys  
130 135 140

Phe Glu Lys Asp Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys  
145 150 155 160

Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly  
165 170 175

Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu Ala Lys Lys Ala  
180 185 190

Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr  
195 200 205

Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys  
 210 215 220  
 Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu  
 225 230 235 240  
 Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu  
 245 250 255  
 Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu  
 260 265 270  
 Glu Ala Lys Arg Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly  
 275 280 285  
 Arg Ala Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys  
 290 295 300  
 Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu  
 305 310 315 320  
 Pro Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys  
 325 330 335  
 Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp  
 340 345 350  
 Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile  
 355 360 365  
 Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys  
 370 375 380  
 Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys  
 385 390 395 400  
 Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile  
 405 410 415  
 Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala  
 420 425 430  
 Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala  
 435 440 445  
 Pro Ala Pro Lys Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn  
 450 455 460  
 Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu  
 465 470 475 480  
 Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln  
 485 490 495  
 Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro  
 500 505 510



<210> 14  
 <211> 589  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 14

Glu Gly Val Arg Ser Gly Asn Asn Leu Thr Val Thr Ser Ser Gly Gln  
 1 5 10 15

Asp Ile Ser Lys Lys Tyr Ala Asp Glu Val Glu Ser His Leu Glu Ser  
 20 25 30

Ile Leu Lys Asp Val Lys Lys Asn Leu Lys Lys Val Gln His Thr Gln  
 35 40 45

Asn Val Gly Leu Ile Thr Lys Leu Ser Glu Ile Lys Lys Lys Tyr Leu  
 50 55 60

Tyr Asp Leu Lys Val Asn Val Leu Ser Glu Ala Glu Leu Thr Ser Lys  
 65 70 75 80

Thr Lys Glu Thr Lys Glu Lys Leu Thr Ala Thr Phe Glu Gln Phe Lys  
 85 90 95

Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys Val Ala Glu Ala Gln  
 100 105 110

Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys  
 115 120 125

Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu  
 130 135 140

Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val  
 145 150 155 160

Lys Val Lys Ala Lys Glu Ser Gln Asp Glu Glu Lys Ile Lys Gln Ala  
 165 170 175

Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys  
 180 185 190

Ile Lys Thr Asp Arg Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu  
 195 200 205

Lys Glu Ala Val Glu Lys Asn Val Ala Thr Ser Glu Gln Asp Lys Pro  
 210 215 220

Lys Arg Arg Ala Lys Arg Gly Val Ser Gly Glu Leu Ala Thr Pro Asp  
 225 230 235 240

Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu  
 245 250 255

Thr Leu Pro Ser Pro Ser Leu Asn Met Ala Asn Glu Ser Gln Thr Glu

C  
 cont'd

260					265					270					
His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys	Met	Leu	Ser	Glu	Ile
		275					280					285			
Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val	Asn	Leu	Asn	Ile	Lys
	290					295					300				
Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu	Leu	Ser	Val	Leu	Lys
305						310					315				320
Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys	Thr	Lys	Ala	Glu	Leu
				325					330					335	
Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Pro	Glu	Lys
			340					345					350		
Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala
		355					360					365			
Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr
	370					375					380				
Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu
385						390					395				400
Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu	Ser	Arg	Asn	Glu
				405					410					415	
Glu	Lys	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu
			420					425						430	
Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu
		435					440						445		
Glu	Ala	Lys	Arg	Lys	Ala	Glu	Glu	Ser	Glu	Lys	Lys	Ala	Ala	Glu	Ala
	450					455					460				
Lys	Gln	Lys	Val	Asp	Ala	Glu	Glu	Tyr	Ala	Leu	Glu	Ala	Lys	Ile	Ala
465						470					475				480
Glu	Leu	Glu	Tyr	Glu	Val	Gln	Arg	Leu	Glu	Lys	Glu	Leu	Lys	Glu	Ile
				485					490					495	
Asp	Glu	Ser	Asp	Ser	Glu	Asp	Tyr	Leu	Lys	Glu	Gly	Leu	Arg	Ala	Pro
			500					505					510		
Leu	Gln	Ser	Lys	Leu	Asp	Thr	Lys	Lys	Ala	Lys	Leu	Ser	Lys	Leu	Glu
			515					520					525		
Glu	Leu	Ser	Asp	Lys	Ile	Asp	Glu	Leu	Asp	Ala	Glu	Ile	Ala	Lys	Leu
	530					535					540				
Glu	Val	Gln	Leu	Lys	Asp	Ala	Glu	Gly	Asn	Asn	Asn	Val	Glu	Ala	Tyr
545						550					555				560
Phe	Lys	Glu	Gly	Leu	Glu	Lys	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu	Leu

565

570

575

Glu Lys Ala Glu Ala Asp Leu Lys Lys Ala Val Asp Glu  
 580 585

<210> 15  
 <211> 21  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 15  
 Lys Thr Gly Trp Lys Gln Glu Asn Gly Asn Trp Tyr Phe Tyr Asn Thr  
 1 5 10 15

Asp Gly Ser Met Ala  
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<210> 16  
 <211> 20  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 16  
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Met  
 1 5 10 15

Gly Ala Met Ala  
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<210> 17  
 <211> 20  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 17  
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
 1 5 10 15

Gly Ser Met Ala  
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<210> 18  
 <211> 20  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 18  
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
 1 5 10 15

Gly Ala Met Ala  
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<210> 19  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 19  
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
1 5 10 15

Gly Asp Met Ala  
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<210> 20  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 20  
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn  
1 5 10 15

Gly Ala Met Ala  
20

<210> 21  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 21  
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
1 5 10 15

Gly Asp Met Ala  
20

<210> 22  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 22  
Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
1 5 10 15

Gly Asp Met Ala  
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<210> 23  
<211> 19  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 23

Thr Gly Trp Leu Gln Tyr Asn Ser Trp Tyr Tyr Leu Asn Ala Asn Gly  
1 5 10 15

Asp Met Ala

<210> 24

<211> 21

<212> PRT

<213> Streptococcus pneumoniae

<400> 24

Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser  
1 5 10 15

Gly Ala Met Lys Ala  
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<210> 25

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 25

Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser  
1 5 10 15

Gly Ala Leu Ala  
20

<210> 26

<211> 18

<212> PRT

<213> Streptococcus pneumoniae

<400> 26

Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp  
1 5 10 15

Val Asn

<210> 27

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 27

Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
1 5 10 15

Gly Ala Met Ala  
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<210> 28  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<220>  
<221> UNSURE  
<222> (1)..(20)  
<223> amino acid "X" can be any amino acid

<400> 28  
Thr Gly Trp Leu Gln Xaa Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
1 5 10 15

Gly Ala Met Ala  
20

<210> 29  
<211> 17  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 29  
Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp  
1 5 10 15

Val

<210> 30  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 30  
Ile Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp  
1 5 10 15

Gly Ser Met Ala  
20

<210> 31  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 31  
Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn  
1 5 10 15

Gly Ala Met Ala  
20

<210> 32  
<211> 20  
<212> PRT  
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<400> 32  
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
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Gly Ala Met Ala  
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<210> 33  
<211> 20  
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<400> 33  
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
1 5 10 15

Gly Ala Met Ala  
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<210> 34  
<211> 20  
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<400> 34  
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
1 5 10 15

Gly Asp Met Ala  
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<210> 35  
<211> 20  
<212> PRT  
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<400> 35  
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
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Gly Asp Met Ala  
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<210> 36

<211> 20  
 <212> PRT  
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 <400> 36  
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   1                  5                  10                  15  
  
 Gly Ser Met Ala  
                   20  
  
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 <212> PRT  
 <213> Streptococcus pneumoniae  
  
 <400> 37  
 Thr Gly Trp Val Lys Asp Gly Glu Thr Trp Tyr Tyr Leu Glu Ala Ser  
   1                  5                  10                  15  
  
 Gly Ser Met Lys Ala  
                   20  
  
 <210> 38  
 <211> 20  
 <212> PRT  
 <213> Streptococcus pneumoniae  
  
 <400> 38  
 Asn Gln Trp Phe Gln Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Leu  
   1                  5                  10                  15  
  
 Gly Ser Leu Ser  
                   20  
  
 <210> 39  
 <211> 17  
 <212> PRT  
 <213> Streptococcus pneumoniae  
  
 <400> 39  
 Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp  
   1                  5                  10                  15  
  
 Val  
  
 <210> 40  
 <211> 20  
 <212> PRT  
 <213> Streptococcus pneumoniae  
  
 <400> 40



Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
1 5 10 15

Gly Ser Met Ala  
20

<210> 41  
<211> 21  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 41  
Lys Thr Gly Trp Lys Gln Glu Asn Gly Asn Trp Tyr Phe Tyr Asn Thr  
1 5 10 15

Asp Gly Ser Met Ala  
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<210> 42  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 42  
Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp  
1 5 10 15

Gly Ser Met Ala  
20

<210> 43  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 43  
Ile Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp  
1 5 10 15

Gly Ser Met Ala  
20

<210> 44  
<211> 21  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 44  
Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser  
1 5 10 15

Gly Ala Met Lys Ala  
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<210> 45  
<211> 21  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 45  
Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser  
1 5 10 15  
Gly Ala Met Lys Ala  
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<210> 46  
<211> 21  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 46  
Thr Gly Trp Val Lys Asp Gly Glu Thr Trp Tyr Tyr Leu Glu Ala Ser  
1 5 10 15  
Gly Ser Met Lys Ala  
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<210> 47  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 47  
Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser  
1 5 10 15  
Gly Ala Leu Ala  
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<210> 48  
<211> 20  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 48  
Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Leu  
1 5 10 15  
Gly Ala Leu Ala  
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<210> 49  
<211> 20  
<212> PRT

<213> Streptococcus pneumoniae

<400> 49

Asn	Gln	Trp	Phe	Gln	Val	Ser	Asp	Lys	Trp	Tyr	Tyr	Val	Asn	Gly	Leu
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Gly	Ser	Leu	Ser
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<210> 50

<211> 18

<212> PRT

<213> Streptococcus pneumoniae

<400> 50

Val	Asn	Thr	Thr	Val	Asp	Gly	Tyr	Gly	Val	Asn	Ala	Asn	Gly	Glu	Trp
1				5					10					15	

Val Asn

<210> 51

<211> 17

<212> PRT

<213> Streptococcus pneumoniae

<400> 51

Val	Asn	Thr	Thr	Val	Asp	Gly	Tyr	Lys	Val	Asn	Ala	Asn	Gly	Glu	Trp
1				5					10					15	

Val

<210> 52

<211> 17

<212> PRT

<213> Streptococcus pneumoniae

<400> 52

Val	Asn	Thr	Thr	Val	Asp	Gly	Tyr	Lys	Val	Asn	Ala	Asn	Gly	Glu	Trp
1				5					10					15	

Val

<210> 53

<211> 1620

<212> DNA

<213> Streptococcus pneumoniae

<220>

<221> CDS

<222> (1)..(1617)

<223> coding sequence for SpsA

<400> 53

atg ttt gca tca aaa agc gaa aga aaa gta cat tat tca att cgt aaa	48
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys	
1 5 10 15	
ttt agt att gga gta gct agt gta gct gtt gcc agt ctt gtt atg gga	96
Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly	
20 25 30	
agt gtg gtt cat gcg aca gag aac gag gga agt acc caa gca gcc act	144
Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr	
35 40 45	
tct tct aat atg gca aag aca gaa cat agg aaa gct gct aaa caa gtc	192
Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val	
50 55 60	
gtc gat gaa tat ata gaa aaa atg ttg agg gag att caa cta gat aga	240
Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg	
65 70 75 80	
aga aaa cat acc caa aat gtc gcc tta aac ata aag ttg agc gca att	288
Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile	
85 90 95	
aaa acg aag tat ttg cgt gaa tta aat gtt tta gaa gag aag tcg aaa	336
Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys	
100 105 110	
gat gag ttg ccg tca gaa ata aaa gca aag tta gac gca gct ttt gag	384
Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu	
115 120 125	
aag ttt aaa aaa gat aca ttg aaa cca gga gaa aag gta gca gaa gct	432
Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala	
130 135 140	
aag aag aag gtt gaa gaa gct aag aaa aaa gcc gag gat caa aaa gaa	480
Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu	
145 150 155 160	
gaa gat cgt cgt aac tac cca acc aat act tac aaa acg ctt gaa ctt	528
Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu	
165 170 175	
gaa att gct gag ttc gat gtg aaa gtt aaa gaa gcg gag ctt gaa cta	576
Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu	
180 185 190	
gta aaa gag gaa gct aaa gaa ttt cga aac gag ggc aca att aag caa	624
Val Lys Glu Glu Ala Lys Glu Phe Arg Asn Glu Gly Thr Ile Lys Gln	
195 200 205	
gca aaa gag aaa gtt gag agt aaa aaa gct gag gct aca agg tta gaa	672
Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu	

210	215	220	
aac atc aag aca gat cgt aaa aaa gca gaa gaa gaa gct aaa cga aaa			720
Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys			
225	230	235	240
gca gca gaa gaa gat aaa gtt aaa gaa aaa cca gct gaa caa cca caa			768
Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln			
245	250	255	
cca gcg ccg gct act caa cca gaa aaa cca gct cca aaa cca gag aag			816
Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys			
260	265	270	
cca gct gaa caa cca aaa gca gaa aaa aca gat gat caa caa gct gaa			864
Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu			
275	280	285	
gaa gac tat gct cgt aga tca gaa gaa gaa tat aat cgc ttg act caa			912
Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln			
290	295	300	
cag caa ccg cca aaa act gaa aaa cca gca caa cca tct act cca aaa			960
Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys			
305	310	315	320
aca ggc tgg aaa caa gaa aac ggt atg tgg tac ttc tac aat act gat			1008
Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp			
325	330	335	
ggt tca atg gca aca gga tgg ctc caa aac aac ggt tca tgg tac tat			1056
Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr			
340	345	350	
cta aac gct aat ggt gct atg gcg aca gga tgg ctc caa aac aat ggt			1104
Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly			
355	360	365	
tca tgg tac tat cta aac gct aat ggt tca atg gca aca gga tgg ctc			1152
Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu			
370	375	380	
caa aac aat ggt tca tgg tac tac cta aac gct aat ggt gct atg gcg			1200
Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala			
385	390	395	400
aca gga tgg ctc caa tac aat ggt tca tgg tac tac cta aac agc aat			1248
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn			
405	410	415	
ggc gct atg gcg aca gga tgg ctc caa tac aat ggc tca tgg tac tac			1296
Gly Ala Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr			
420	425	430	
ctc aac gct aat ggt gat atg gcg aca gga tgg ctc caa aac aac ggt			1344
Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly			
435	440	445	

tca tgg tac tac ctc aac gct aat ggt gat atg gcg aca gga tgg ctc 1392  
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu  
 450 455 460

caa tac aac ggt tca tgg tat tac ctc aac gct aat ggt gat atg gcg 1440  
 Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala  
 465 470 475 480

aca ggt tgg gtg aaa gat gga gat acc tgg tac tat ctt gaa aca tca 1488  
 Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Thr Ser  
 485 490 495

ggt gct atg aaa gca agc caa tgg ttc aaa gta tca gat aaa tgg tac 1536  
 Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr  
 500 505 510

tat gtc cat ggc tca agt gcc ctt gca atc aac aca act gta tat ggc 1584  
 Tyr Val His Gly Ser Ser Ala Leu Ala Ile Asn Thr Thr Val Tyr Gly  
 515 520 525

tat gga gtc aat gcc aat ggt gaa tgg gta aac taa 1620  
 Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn  
 530 535

<210> 54

<211> 539

<212> PRT

<213> Streptococcus pneumoniae

<400> 54

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
 1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly  
 20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr  
 35 40 45

Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val  
 50 55 60

Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg  
 65 70 75 80

Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile  
 85 90 95

Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys  
 100 105 110

Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu  
 115 120 125

Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala

130	135	140
Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu 145 150 155 160		
Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu 165 170 175		
Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu 180 185 190		
Val Lys Glu Glu Ala Lys Glu Phe Arg Asn Glu Gly Thr Ile Lys Gln 195 200 205		
Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu 210 215 220		
Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys 225 230 235 240		
Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln 245 250 255		
Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys 260 265 270		
Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu 275 280 285		
Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln 290 295 300		
Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys 305 310 315 320		
Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp 325 330 335		
Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr 340 345 350		
Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly 355 360 365		
Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu 370 375 380		
Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala 385 390 395 400		
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn 405 410 415		
Gly Ala Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr 420 425 430		
Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly		

435	440	445
Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu 450 455 460		
Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala 465 470 475 480		
Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Thr Ser 485 490 495		
Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr 500 505 510		
Tyr Val His Gly Ser Ser Ala Leu Ala Ile Asn Thr Thr Val Tyr Gly 515 520 525		
Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn 530 535		

<210> 55  
 <211> 1746  
 <212> DNA  
 <213> Streptococcus pneumoniae

<220>  
 <221> CDS  
 <222> (1)..(1743)  
 <223> additional coding sequence for SpsA

<400> 55	
atg ttt gca tca aaa agc gaa aga aaa gta cat tat tca att cgt aaa Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys 1 5 10 15	48
ttt agt att gga gta gct agt gta gct gtt gcc agt ctt gtt atg gga Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly 20 25 30	96
agt gtg gtt cat gcg aca gag aac gag gga agt acc caa gca gcc act Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr 35 40 45	144
tct tct aat atg gca aag aca gaa cat agg aaa gct gct aaa caa gtc Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val 50 55 60	192
gtc gat gaa tat ata gaa aaa atg ttg agg gag att caa cta gat aga Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg 65 70 75 80	240
aga aaa cat acc caa aat gtc gcc tta aac ata aag ttg agc gca att Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile 85 90 95	288



aaa acg aag tat ttg cgt gaa tta aat gtt tta gaa gag aag tcg aaa	336
Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys	
100 105 110	
gat gag ttg ccg tca gaa ata aaa gca aag tta gac gca gct ttt gag	384
Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu	
115 120 125	
aag ttt aaa aaa gat aca ttg aaa cca gga gaa aag gta gca gaa gct	432
Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala	
130 135 140	
aag aag aag gtt gaa gaa gct aag aaa aaa gcc gag gat caa aaa gaa	480
Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu	
145 150 155 160	
gaa gat cgt cgt aac tac cca acc aat act tac aaa acg ctt gaa ctt	528
Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu	
165 170 175	
gaa att gct gag ttc gat gtg aaa gtt aaa gaa gcg gag ctt gaa cta	576
Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu	
180 185 190	
gta aaa gag gaa gct aaa gaa tct cga aac gag ggc aca att aag caa	624
Val Lys Glu Glu Ala Lys Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln	
195 200 205	
gca aaa gag aaa gtt gag agt aaa aaa gct gag gct aca agg tta gaa	672
Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu	
210 215 220	
aac atc aag aca gat cgt aaa aaa gca gaa gaa gaa gct aaa cga aaa	720
Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys	
225 230 235 240	
gca gat gct aag ttg aag gaa gct aat gta gcg act tca gat caa ggt	768
Ala Asp Ala Lys Leu Lys Glu Ala Asn Val Ala Thr Ser Asp Gln Gly	
245 250 255	
aaa cca aag ggg cgg gca aaa cga gga gtt cct gga gag cta gca aca	816
Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu Leu Ala Thr	
260 265 270	
cct gat aaa aaa gaa aat gat gcg aag tct tca gat tct agc gta ggt	864
Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly	
275 280 285	
gaa gaa act ctt cca agc tca tcc ctg aaa tca gga aaa aag gta gca	912
Glu Glu Thr Leu Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala	
290 295 300	
gaa gct gag aag aag gtt gaa gaa gct gag aaa aaa gcc aag gat caa	960
Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln	
305 310 315 320	
aaa gaa gaa gat cgc cgt aat tac cca acc aat act tac aaa acg ctt	1008

Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	
				325					330					335		
gac	ctt	gaa	att	gct	gag	tcc	gat	gtg	aaa	gtt	aaa	gaa	gcg	gag	ctt	1056
Asp	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	
			340					345					350			
gaa	cta	gta	aaa	gag	gaa	gct	aag	gaa	cct	cga	gac	gag	gaa	aaa	att	1104
Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile	
			355					360				365				
aag	caa	gca	aaa	gcg	aaa	gtt	gag	agt	aaa	aaa	gct	gag	gct	aca	agg	1152
Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	
	370						375					380				
tta	gaa	aac	atc	aag	aca	gat	cgt	aaa	aaa	gca	gaa	gaa	gaa	gct	aaa	1200
Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	
	385				390					395					400	
cga	aaa	gca	gca	gaa	gaa	gat	aaa	gtt	aaa	gaa	aaa	cca	gct	gaa	caa	1248
Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	
				405					410					415		
cca	caa	cca	gcg	ccg	gct	act	caa	cca	gaa	aaa	cca	gct	cca	aaa	cca	1296
Pro	Gln	Pro	Ala	Pro	Ala	Thr	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	
			420					425					430			
gag	aag	cca	gct	gaa	caa	cca	aaa	gca	gaa	aaa	aca	gat	gat	caa	caa	1344
Glu	Lys	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln	
			435				440						445			
gct	gaa	gaa	gac	tat	gct	cgt	aga	tca	gaa	gaa	gaa	tat	aat	cgc	ttg	1392
Ala	Glu	Glu	Asp	Tyr	Ala	Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	
	450					455						460				
att	caa	cag	caa	ccg	cca	aaa	act	gaa	aaa	cca	gca	caa	cca	ttt	act	1440
Ile	Gln	Gln	Gln	Pro	Pro	Lys	Thr	Glu	Lys	Pro	Ala	Gln	Pro	Phe	Thr	
	465					470				475					480	
cca	aaa	aca	ggc	tgg	aaa	caa	gaa	aac	ggg	atg	tgg	tac	ttc	tac	aat	1488
Pro	Lys	Thr	Gly	Trp	Lys	Gln	Glu	Asn	Gly	Met	Trp	Tyr	Phe	Tyr	Asn	
			485					490						495		
act	gat	ggg	tca	atg	gca	aca	gga	tgg	ctc	caa	tac	aac	ggg	tca	tgg	1536
Thr	Asp	Gly	Ser	Met	Ala	Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	
			500					505					510			
tat	tac	ctc	aac	gct	aat	ggg	gat	atg	gcg	aca	ggg	tgg	gtg	aaa	gat	1584
Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	Trp	Val	Lys	Asp	
			515				520						525			
gga	gat	acc	tgg	tac	tat	ctt	gaa	gca	tca	ggg	gct	atg	aaa	gca	agc	1632
Gly	Asp	Thr	Trp	Tyr	Tyr	Leu	Glu	Ala	Ser	Gly	Ala	Met	Lys	Ala	Ser	
			530				535				540					
caa	tgg	ttc	aaa	gta	tca	gat	aaa	tgg	tac	tat	gtc	aat	ggc	tca	ggg	1680
Gln	Trp	Phe	Lys	Val	Ser	Asp	Lys	Trp	Tyr	Tyr	Val	Asn	Gly	Ser	Gly	



210	215	220
Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys 225 230 235 240		
Ala Asp Ala Lys Leu Lys Glu Ala Asn Val Ala Thr Ser Asp Gln Gly 245 250 255		
Lys Pro Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu Leu Ala Thr 260 265 270		
Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly 275 280 285		
Glu Glu Thr Leu Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala 290 295 300		
Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln 305 310 315 320		
Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu 325 330 335		
Asp Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu 340 345 350		
Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile 355 360 365		
Lys Gln Ala Lys Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg 370 375 380		
Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys 385 390 395 400		
Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln 405 410 415		
Pro Gln Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro 420 425 430		
Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln 435 440 445		
Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu 450 455 460		
Ile Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Phe Thr 465 470 475 480		
Pro Lys Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn 485 490 495		
Thr Asp Gly Ser Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp 500 505 510		
Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val Lys Asp		

515	520	525
Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys Ala Ser		
530	535	540
Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly		
545	550	555
Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn		
	565	570
		575
Gly Glu Trp Val Asn		
580		

<210> 57  
 <211> 2480  
 <212> DNA  
 <213> Streptococcus pneumoniae

<220>  
 <221> CDS  
 <222> (1)..(1992)  
 <223> coding sequence for CbpA

<400> 57  
 gaa aac gaa gga agt acc caa gca gcc act tct tct aat atg gca aag 48  
 Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
 1 5 10 15  
 aca gaa cat agg aaa gct gct aaa caa gtc gtc gat gaa tat ata gaa 96  
 Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
 20 25 30  
 aaa atg ttg agg gag att caa cta gat aga aga aaa cat acc caa aat 144  
 Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
 35 40 45  
 gtc gcc tta aac ata aag ttg agc gca att aaa acg aag tat ttg cgt 192  
 Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
 50 55 60  
 gaa tta aat gtt tta gaa gag aag tcg aaa gat gag ttg ccg tca gaa 240  
 Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
 65 70 75 80  
 ata aaa gca aag tta gac gca gct ttt gag aag ttt aaa aaa gat aca 288  
 Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
 85 90 95  
 ttg aaa cca gga gaa aag gta gca gaa gct aag aag aag gtt gaa gaa 336  
 Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
 100 105 110  
 gct aag aaa aaa gcc gag gat caa aaa gaa gaa gat cgt cgt aac tac 384  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr

115	120	125	
cca acc aat act tac aaa acg ctt gaa ctt gaa att gct gag ttc gat			432
Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp			
130	135	140	
gtg aaa gtt aaa gaa gcg gag ctt gaa cta gta aaa gag gaa gct aaa			480
Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys			
145	150	155	160
gaa tct cga aac gag ggc aca att aag caa gca aaa gag aaa gtt gag			528
Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu			
165	170	175	
agt aaa aaa gct gag gct aca agg tta gaa aac atc aag aca gat cgt			576
Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg			
180	185	190	
aaa aaa gca gaa gaa gaa gct aaa cga aaa gca gat gct aag ttg aag			624
Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys			
195	200	205	
gaa gct aat gta gcg act tca gat caa ggt aaa cca aag ggg cgg gca			672
Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala			
210	215	220	
aaa cga gga gtt cct gga gag cta gca aca cct gat aaa aaa gaa aat			720
Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn			
225	230	235	240
gat gcg aag tct tca gat tct agc gta ggt gaa gaa act ctt cca agc			768
Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser			
245	250	255	
tca tcc ctg aaa tca gga aaa aag gta gca gaa gct gag aag aag gtt			816
Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val			
260	265	270	
gaa gaa gct gag aaa aaa gcc aag gat caa aaa gaa gaa gat cgc cgt			864
Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg			
275	280	285	
aac tac cca acc aat act tac aaa acg ctt gac ctt gaa att gct gag			912
Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu			
290	295	300	
tcc gat gtg aaa gtt aaa gaa gcg gag ctt gaa cta gta aaa gag gaa			960
Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu			
305	310	315	320
gct aag gaa cct cga gac gag gaa aaa att aag caa gca aaa gcg aaa			1008
Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys			
325	330	335	
gtt gag agt aaa aaa gct gag gct aca agg tta gaa aac atc aag aca			1056
Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr			
340	345	350	



gat cgt aaa aaa gca gaa gaa gaa gct aaa cga aaa gca gca gaa gaa	1104
Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu	
355 360 365	
gat aaa gtt aaa gaa aaa cca gct gaa caa cca caa cca gcg ccg gct	1152
Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala	
370 375 380	
act caa cca gaa aaa cca gct cca aaa cca gag aag cca gct gaa caa	1200
Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln	
385 390 395 400	
cca aaa gca gaa aaa aca gat gat caa caa gct gaa gaa gac tat gct	1248
Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu Asp Tyr Ala	
405 410 415	
cgt aga tca gaa gaa gaa tat aat cgc ttg act caa cag caa ccg cca	1296
Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro	
420 425 430	
aaa act gaa aaa cca gca caa cca tct act cca aaa aca ggc tgg aaa	1344
Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys	
435 440 445	
caa gaa aac ggt atg tgg tac ttc tac aat act gat ggt tca atg gca	1392
Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala	
450 455 460	
aca gga tgg ctc caa aac aac ggt tca tgg tac tat cta aac gct aat	1440
Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn	
465 470 475 480	
ggt gct atg gcg aca gga tgg ctc caa aac aat ggt tca tgg tac tat	1488
Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr	
485 490 495	
cta aac gct aat ggt tca atg gca aca gga tgg ctc caa aac aat ggt	1536
Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly	
500 505 510	
tca tgg tac tac cta aac gct aat ggt gct atg gcg aca gga tgg ctc	1584
Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu	
515 520 525	
caa tac aat ggt tca tgg tac tac cta aac agc aat ggc gct atg gcg	1632
Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala	
530 535 540	
aca gga tgg ctc caa tac aat ggc tca tgg tac tac ctc aac gct aat	1680
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn	
545 550 555 560	
ggt gat atg gcg aca gga tgg ctc caa aac aac ggt tca tgg tac tac	1728
Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr	
565 570 575	

ctc aac gct aat ggt gat atg gcg aca gga tgg ctc caa tac aac ggt 1776  
 Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly  
                   580                                  585                                  590

tca tgg tat tac ctc aac gct aat ggt gat atg gcg aca ggt tgg gtg 1824  
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val  
                   595                                  600                                  605

aaa gat gga gat acc tgg tac tat ctt gaa gca tca ggt gct atg aaa 1872  
 Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys  
                   610                                  615                                  620

gca agc caa tgg ttc aaa gta tca gat aaa tgg tac tat gtc aat ggc 1920  
 Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly  
                   625                                  630                                  635                                  640

tca ggt gcc ctt gca gtc aac aca act gta gat ggc tat gga gtc aat 1968  
 Ser Gly Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn  
                                   645                                  650                                  655

gcc aat ggt gaa tgg gta aac taa acctaataata actagttaat actgacttcc 2022  
 Ala Asn Gly Glu Trp Val Asn  
                                   660

tgtaagaact ttttaaagta ttccctacaa ataccatatt ctttcagtag ataataatcc 2082

cttgtaggaa gtttagatta aaaaataact ctgtaatctc tagccggatt tatagcgcta 2142

gagactacgg agtttttttg atgaggaaaag aatggcgcca ttcaagagac tctttaagag 2202

agttacgggt tttaaactat taagccttct ccaattgcaa gaggcttcaa tctctgctag 2262

ggtgctagct tgcgaaatgg ctccacggag tttggcagcg ccagatgttc cacggagata 2322

gtgaggagcg aggccgcgga attcacgaac tgcgacgttt tctcctttga ggtaaatcaa 2382

tcgtttcaag tgttcgtagg cgatcttcat cttgtcttca aaggtcaaat caggtaggat 2442

ttctcctgtt tcaaagttta tggtaggcct gggtgaag 2480

<210> 58

<211> 663

<212> PRT

<213> Streptococcus pneumoniae

<400> 58

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
   1                                  5                                  10                                  15  
 Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
                   20                                  25                                  30  
 Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
                   35                                  40                                  45  
 Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
                   50                                  55                                  60  
 Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
   65                                  70                                  75                                  80







gct gat gaa gtc gag tcg cat cta gaa agt ata ttg aag gat gtc aaa	543
Ala Asp Glu Val Glu Ser His Leu Glu Ser Ile Leu Lys Asp Val Lys	
60 65 70 75	
aaa aat ttg aaa aaa gtt caa cat acc caa aat gtc ggc tta att aca	591
Lys Asn Leu Lys Lys Val Gln His Thr Gln Asn Val Gly Leu Ile Thr	
80 85 90	
aag ttg agc gaa att aaa aag aag tat ttg tat gac tta aaa gtt aat	639
Lys Leu Ser Glu Ile Lys Lys Lys Tyr Leu Tyr Asp Leu Lys Val Asn	
95 100 105	
gtt tta tcg gaa gct gag ttg acg tca aaa aca aaa gaa aca aaa gaa	687
Val Leu Ser Glu Ala Glu Leu Thr Ser Lys Thr Lys Glu Thr Lys Glu	
110 115 120	
aag tta acc gca act ttt gag cag ttt aaa aaa gat aca tta cca aca	735
Lys Leu Thr Ala Thr Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr	
125 130 135	
gaa cca gaa aaa aag gta gca gaa gct cag aag aag gtt gaa gaa gct	783
Glu Pro Glu Lys Lys Val Ala Glu Ala Gln Lys Lys Val Glu Glu Ala	
140 145 150 155	
aag aaa aaa gcc gag gat caa aaa gaa aaa gat cgc cgt aac tac cca	831
Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Arg Arg Asn Tyr Pro	
160 165 170	
acc att act tac aaa acg ctt gaa ctt gaa att gct gag tcc gat gtg	879
Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val	
175 180 185	
gaa gtt aaa aaa gcg gag ctt gaa cta gta aaa gtg aaa gct aag gaa	927
Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Lys Glu	
190 195 200	
tct caa gac gag gaa aaa att aag caa gca gaa gcg gaa gtt gag agt	975
Ser Gln Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser	
205 210 215	
aaa caa gct gag gct aca agg tta aaa aaa atc aag aca gat cgt gaa	1023
Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu	
220 225 230 235	
gaa gct aaa cga aaa gca gat gct aag ttg aag gaa gct gtt gaa aag	1071
Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys Glu Ala Val Glu Lys	
240 245 250	
aat gta gcg act tca gag caa gat aaa cca aag agg cgg gca aaa cga	1119
Asn Val Ala Thr Ser Glu Gln Asp Lys Pro Lys Arg Arg Ala Lys Arg	
255 260 265	
gga gtt tct gga gag cta gca aca cct gat aaa aaa gaa aat gat gcg	1167
Gly Val Ser Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala	
270 275 280	
aag tct tca gat tct agc gta ggt gaa gaa act ctt cca agc cca tcc	1215

Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser		
285						290					295						
ctt	aat	atg	gca	aat	gaa	agt	cag	aca	gaa	cat	agg	aaa	gat	gtc	gat	1263	
Leu	Asn	Met	Ala	Asn	Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp		
300					305					310					315		
gaa	tat	ata	aaa	aaa	atg	ttg	agt	gag	atc	caa	tta	gat	aga	aga	aaa	1311	
Glu	Tyr	Ile	Lys	Lys	Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys		
				320					325					330			
cat	acc	caa	aat	gtc	aac	tta	aac	ata	aag	ttg	agc	gca	att	aaa	acg	1359	
His	Thr	Gln	Asn	Val	Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr		
			335					340					345				
aag	tat	ttg	tat	gaa	tta	agt	gtt	tta	aaa	gag	aac	tcg	aaa	aaa	gaa	1407	
Lys	Tyr	Leu	Tyr	Glu	Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu		
		350					355					360					
gag	ttg	acg	tca	aaa	acc	aaa	gca	gag	tta	acc	gca	gct	ttt	gag	cag	1455	
Glu	Leu	Thr	Ser	Lys	Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln		
		365				370					375						
ttt	aaa	aaa	gat	aca	ttg	aaa	cca	gaa	aaa	aag	gta	gca	gaa	gct	gag	1503	
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380					385					390					395		
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Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu		
				400					405					410			
gat	cgc	cgt	aac	tac	cca	acc	aat	act	tac	aaa	acg	ctt	gaa	ctt	gaa	1599	
Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu		
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Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val		
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Lys	Glu	Glu	Ala	Asn	Glu	Ser	Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala		
	445					450					455						
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Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys		
460					465					470					475		
atc	aag	aca	gat	cgt	aaa	aaa	gca	gaa	gaa	gaa	gct	aaa	cga	aaa	gca	1791	
Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala		
				480					485					490			
gaa	gaa	tct	gag	aaa	aaa	gct	gct	gaa	gcc	aaa	caa	aaa	gtg	gat	gct	1839	
Glu	Glu	Ser	Glu	Lys	Lys	Ala	Ala	Glu	Ala	Lys	Gln	Lys	Val	Asp	Ala		
			495					500					505				
gaa	gaa	tat	gct	ctt	gaa	gct	aaa	atc	gct	gag	ttg	gaa	tat	gaa	gtt	1887	
Glu	Glu	Tyr	Ala	Leu	Glu	Ala	Lys	Ile	Ala	Glu	Leu	Glu	Tyr	Glu	Val		

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acc aaa aaa gct aaa cta tca aaa ctt gaa gag ttg agt gat aag att Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Leu Ser Asp Lys Ile 560 565 570			2031
gat gag tta gac gct gaa att gca aaa ctt gaa gtt caa ctt aaa gat Asp Glu Leu Asp Ala Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp 575 580 585			2079
gct gaa gga aac aat aat gta gaa gcc tac ttt aaa gaa ggt tta gag Ala Glu Gly Asn Asn Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu 590 595 600			2127
aaa act act gct gag aaa aaa gct gaa tta gaa aaa gct gaa gct gac Lys Thr Thr Ala Glu Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp 605 610 615			2175
ctt aag aaa gca gtt gat gag cca gaa act cca gct ccg gct cct caa Leu Lys Lys Ala Val Asp Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln 620 625 630 635			2223
cca gct cca gct cca gaa aaa cca gct gaa aaa cca gct cca gct cca Pro Ala Pro Ala Pro Glu Lys Pro Ala Glu Lys Pro Ala Pro Ala Pro 640 645 650			2271
gaa aaa cca gct cca gct cca gaa aaa cca gct cca gct cca gaa aaa Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys 655 660 665			2319
cca gct cca gct cca gaa aaa cca gct cca gct cca gaa aaa cca gct Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala 670 675 680			2367
cca act cca gaa act cca aaa aca ggc tgg aaa caa gaa aac ggt atg Pro Thr Pro Glu Thr Pro Lys Thr Gly Trp Lys Gln Glu Asn Gly Met 685 690 695			2415
tgg tac ttc tac aat act gat ggt tca atg gca aca ggc tgg ctc caa Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala Thr Gly Trp Leu Gln 700 705 710 715			2463
aac aat ggc tca tgg tac tac ctc aac agc aat ggc gct atg gcg aca Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala Thr 720 725 730			2511
gga tgg ctc caa aac aat ggc tca tgg tac tac ctc aac agc aat ggc Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly 735 740 745			2559

gct atg gcg aca gga tgg ctc caa tac aat ggt tca tgg tac tac ctc	2607
Ala Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu	
750 755 760	
aac gct aat ggt gat atg gcg aca gga tgg ctc caa tac aat ggt tca	2655
Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser	
765 770 775	
tgg tac tac ctc aac gct aat ggt gat atg gcg aca gga tgg ttc caa	2703
Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Phe Gln	
780 785 790 795	
tac aat ggt tca tgg tac tac ctc aac gct aat ggt gat atg gcg aca	2751
Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr	
800 805 810	
gga tgg ttc caa tac aat ggt tca tgg tac tac ctc aac gct aat ggt	2799
Gly Trp Phe Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly	
815 820 825	
gat atg gcg aca gga tgg ctc caa tac aat ggt tca tgg tac tac cta	2847
Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu	
830 835 840	
aac agc aat ggt gct atg gta aca gga tgg ctc caa aac aat ggc tca	2895
Asn Ser Asn Gly Ala Met Val Thr Gly Trp Leu Gln Asn Asn Gly Ser	
845 850 855	
tgg tac tac cta aac gct aac ggt tca atg gca aca gat tgg gtg aaa	2943
Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Asp Trp Val Lys	
860 865 870 875	
gat gga gat acc tgg tac tat ctt gaa gca tca ggt gct atg aaa gca	2991
Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys Ala	
880 885 890	
agc caa tgg ttc aaa gta tca gat aaa tgg tac tat gtc aat ggc tca	3039
Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser	
895 900 905	
ggt gcc ctt gca gtc aac aca act gta gat agc tat aga gtc aat gcc	3087
Gly Ala Leu Ala Val Asn Thr Val Asp Ser Tyr Arg Val Asn Ala	
910 915 920	
aat ggt gaa tgg gta aac taaacttaat ataactagtt aatactgact	3135
Asn Gly Glu Trp Val Asn	
925	
tctgtgaaga actctttaaa gtattcccta caaataccat atcctttcag tagataatat	3195
acccttgtag gaagtttaga ttaaaaaata actctgtaat ctctagccgg atttatagcg	3255
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gagagttacg ggttttaaac tattaagctt tctccaattg caagagggct tcaatctctg	3375

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3463

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<212> PRT

<213> Streptococcus pneumoniae

<400> 60

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Gly Val Val His Ala Glu Gly Val Arg Ser Gly Asn Asn Leu Thr Val  
35 40 45

Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys Tyr Ala Asp Glu Val Glu  
50 55 60

Ser His Leu Glu Ser Ile Leu Lys Asp Val Lys Lys Asn Leu Lys Lys  
65 70 75 80

Val Gln His Thr Gln Asn Val Gly Leu Ile Thr Lys Leu Ser Glu Ile  
85 90 95

Lys Lys Lys Tyr Leu Tyr Asp Leu Lys Val Asn Val Leu Ser Glu Ala  
100 105 110

Glu Leu Thr Ser Lys Thr Lys Glu Thr Lys Glu Lys Leu Thr Ala Thr  
115 120 125

Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys  
130 135 140

Val Ala Glu Ala Gln Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu  
145 150 155 160

Asp Gln Lys Glu Lys Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys  
165 170 175

Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala  
180 185 190

Glu Leu Glu Leu Val Lys Val Lys Ala Lys Glu Ser Gln Asp Glu Glu  
195 200 205

Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala  
210 215 220

Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Lys Arg Lys  
225 230 235 240

Ala Asp Ala Lys Leu Lys Glu Ala Val Glu Lys Asn Val Ala Thr Ser

245					250					255					
Glu	Gln	Asp	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu
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Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser
		275					280					285			
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn
	290					295					300				
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys
305						310					315				320
Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val
				325					330					335	
Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu
			340					345					350		
Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys
		355					360					365			
Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr
	370					375					380				
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu
385						390					395				400
Ala	Lys	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr
				405					410					415	
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp
			420					425					430		
Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn
		435					440					445			
Glu	Ser	Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu
	450					455					460				
Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg
465						470					475			480	
Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Glu	Glu	Ser	Glu	Lys
				485					490					495	
Lys	Ala	Ala	Glu	Ala	Lys	Gln	Lys	Val	Asp	Ala	Glu	Glu	Tyr	Ala	Leu
			500					505					510		
Glu	Ala	Lys	Ile	Ala	Glu	Leu	Glu	Tyr	Glu	Val	Gln	Arg	Leu	Glu	Lys
		515					520					525			
Glu	Leu	Lys	Glu	Ile	Asp	Glu	Ser	Asp	Ser	Glu	Asp	Tyr	Leu	Lys	Glu
	530					535					540				
Gly	Leu	Arg	Ala	Pro	Leu	Gln	Ser	Lys	Leu	Asp	Thr	Lys	Lys	Ala	Lys



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Leu Ser Lys Leu Glu Glu Leu Ser Asp Lys Ile Asp Glu Leu Asp Ala						
	565			570		575
Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly Asn Asn						
	580			585		590
Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr Ala Glu						
	595			600		605
Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Leu Lys Lys Ala Val						
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Asp Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln Pro Ala Pro Ala Pro						
	625			630		640
Glu Lys Pro Ala Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro						
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Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro						
	660			665		670
Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Thr Pro Glu Thr						
	675			680		685
Pro Lys Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn						
	690			695		700
Thr Asp Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp						
	705			710		715
Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala Thr Gly Trp Leu Gln Asn						
	725			730		735
Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala Thr Gly						
	740			745		750
Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp						
	755			760		765
Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn						
	770			775		780
Ala Asn Gly Asp Met Ala Thr Gly Trp Phe Gln Tyr Asn Gly Ser Trp						
	785			790		800
Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Phe Gln Tyr						
	805			810		815
Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly						
	820			825		830
Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala						
	835			840		845
Met Val Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn						

850		855		860
Ala Asn Gly Ser Met	Ala Thr Asp Trp Val	Lys Asp Gly Asp Thr	Trp	
865	870	875	880	
Tyr Tyr Leu Glu Ala	Ser Gly Ala Met Lys	Ala Ser Gln Trp Phe	Lys	
	885	890	895	
Val Ser Asp Lys Trp	Tyr Tyr Val Asn	Gly Ser Gly Ala Leu	Ala Val	
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Asn Thr Thr Val Asp	Ser Tyr Arg Val	Asn Ala Asn Gly	Glu Trp Val	
	915	920	925	

Asn

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 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 61  
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 35 40 45  
 Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys Tyr Ala Asp Glu Val Glu  
 50 55 60  
 Ser His Leu Glu Ser Ile Leu Lys Asp Val Lys Lys Asn Leu Lys Lys  
 65 70 75 80  
 Val Gln His Thr Gln Asn Val Gly Leu Ile Thr Lys Leu Ser Glu Ile  
 85 90 95  
 Lys Lys Lys Tyr Leu Tyr Asp Leu Lys Val Asn Val Leu Ser Glu Ala  
 100 105 110  
 Glu Leu Thr Ser Lys Thr Lys Glu Thr Lys Glu Lys Leu Thr Ala Thr  
 115 120 125  
 Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys  
 130 135 140  
 Val Ala Glu Ala Gln Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu  
 145 150 155 160  
 Asp Gln Lys Glu Lys Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys  
 165 170 175

Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala		180	185	190
Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	Lys	Glu	Ser	Gln	Asp	Glu	Glu		195	200	205
Lys	Ile	Lys	Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala		210	215	220
Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Lys	Arg	Lys		225	230	235
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Val	Glu	Lys	Asn	Val	Ala	Thr	Ser		245	250	255
Glu	Gln	Asp	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu		260	265	270
Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser		275	280	285
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn		290	295	300
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys		305	310	315
Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val		325	330	335
Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu		340	345	350
Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys		355	360	365
Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr		370	375	380
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu		385	390	395
Ala	Lys	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr		405	410	415
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ala	Glu	Ser	Asp	Val		420	425	430
Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu		435	440	445
Ser	Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser		450	455	460
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys		465	470	475
																			480

Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys  
 485 490 495  
 Ala Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu  
 500 505 510  
 Ala Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu  
 515 520 525  
 Leu Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly  
 530 535 540  
 Leu Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu  
 545 550 555 560  
 Ser Lys Leu Glu Glu Leu Ser Asp Lys Ile Asp Glu Leu Asp Ala Glu  
 565 570 575  
 Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly Asn Asn Asn  
 580 585 590  
 Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr Ala Glu Lys  
 595 600 605  
 Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Leu Lys Lys Ala Val Asp  
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 Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln Pro Ala Pro Ala Pro Glu  
 625 630 635 640  
 Lys Pro Ala Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala  
 645 650 655  
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 Lys Thr  
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Val	Gln	His	Thr	Gln	Asn	Val	Gly	Leu	Ile	Thr	Lys	Leu	Ser	Glu	Ile
				85					90					95	
Lys	Lys	Lys	Tyr	Leu	Tyr	Asp	Leu	Lys	Val	Asn	Val	Leu	Ser	Glu	Ala
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Glu	Leu	Thr	Ser	Lys	Thr	Lys	Glu	Thr	Lys	Glu	Lys	Leu	Thr	Ala	Thr
		115					120						125		
Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Glu	Lys	Lys
130						135					140				
Val	Ala	Glu	Ala	Gln	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu
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Asp	Gln	Lys	Glu	Lys	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys
				165					170					175	
Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala
		180						185					190		
Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	Lys	Glu	Ser	Gln	Asp	Glu	Glu
		195					200						205		
Lys	Ile	Lys	Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala
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Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Lys	Arg	Lys
225					230					235					240
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Val	Glu	Lys	Asn	Val	Ala	Thr	Ser
				245					250					255	
Glu	Gln	Asp	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu
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Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser
	275						280					285			
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn
	290					295					300				
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys
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Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val
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Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu

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Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	
370					375					380						
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	
385					390					395					400	
Ala	Lys	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	
405					410					415						
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ala	Glu	Ser	Asp	Val	
420					425					430						
Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu	
435					440					445						
Ser	Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	
450					455					460						
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	
465					470					475					480	
Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Glu	Glu	Ser	Glu	Lys	Lys	
485					490					495						
Ala	Ala	Glu	Ala	Lys	Gln	Lys	Val	Asp	Ala	Glu	Glu	Tyr	Ala	Leu	Glu	
500					505					510						
Ala	Lys	Ile	Ala	Glu	Leu	Glu	Tyr	Glu	Val	Gln	Arg	Leu	Glu	Lys	Glu	
515					520					525						
Leu	Lys	Glu	Ile	Asp	Glu	Ser	Asp	Ser	Glu	Asp	Tyr	Leu	Lys	Glu	Gly	
530					535					540						
Leu	Arg	Ala	Pro	Leu	Gln	Ser	Lys	Leu	Asp	Thr	Lys	Lys	Ala	Lys	Leu	
545					550					555					560	
Ser	Lys	Leu	Glu	Glu	Leu	Ser	Asp	Lys	Ile	Asp	Glu	Leu	Asp	Ala	Glu	
565					570					575						
Ile	Ala	Lys	Leu	Glu	Val	Gln	Leu	Lys	Asp	Ala	Glu	Gly	Asn	Asn	Asn	
580					585					590						
Val	Glu	Ala	Tyr	Phe	Lys	Glu	Gly	Leu	Glu	Lys	Thr	Thr	Ala	Glu	Lys	
595					600					605						
Lys	Ala	Glu	Leu	Glu	Lys	Ala	Glu	Ala	Asp	Leu	Lys	Lys	Ala	Val	Asp	
610					615					620						
Glu	Pro	Glu	Thr	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Glu	
625					630					635					640	
Lys	Pro	Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	

645	650	655
Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala		
660	665	670
Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu		
675	680	685
Lys Pro Ala Pro Ala Pro Lys Pro Glu Thr Pro Glu Thr		
690	695	700

<210> 63  
 <211> 670  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 63  
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
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 Phe Ser Ile Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly  
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 Ser Val Val His Ala Thr Glu Asn Glu Gly Ile Thr Gln Val Ala Thr  
 35 40 45  
 Ser Tyr Asn Lys Ala Asn Glu Ser Gln Thr Glu His Arg Lys Ala Ala  
 50 55 60  
 Lys Gln Val Asp Glu Asp Ile Lys Lys Met Leu Ser Glu Ile Gln Glu  
 65 70 75 80  
 Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln Leu Asp Lys Arg Lys His  
 85 90 95  
 Thr Gln Asn Val Asn Leu Asn Arg Lys Leu Ser Ala Ile Gln Thr Lys  
 100 105 110  
 Tyr Leu Tyr Glu Leu Arg Val Leu Lys Glu Lys Ser Lys Lys Glu Glu  
 115 120 125  
 Leu Thr Ser Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu  
 130 135 140  
 Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val  
 145 150 155 160  
 Lys Glu Glu Ala Lys Pro Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys  
 165 170 175  
 Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Glu Ile  
 180 185 190  
 Lys Thr Glu Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu  
 195 200 205

Glu	Ser	Glu	Lys	Lys	Ala	Ala	Glu	Ala	Lys	Gln	Lys	Val	Asp	Thr	Lys	
210						215					220					
Glu	Gln	Gly	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu	
225					230					235					240	
Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	
				245					250					255		
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn	
			260					265					270			
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys	
			275				280					285				
Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val	
290						295					300					
Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu	
305					310					315					320	
Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys	
				325					330					335		
Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	
			340					345					350			
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	
		355					360					365				
Ala	Lys	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	
				370		375					380					
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ala	Glu	Ser	Asp	Val	
385					390					395					400	
Lys	Val	Asp	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu	
				405				410						415		
Ser	Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	
			420					425					430			
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Asp	Arg	
		435					440					445				
Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Glu	Glu	Ser	Glu	Lys	
		450				455					460					
Lys	Ala	Ala	Glu	Ala	Lys	Gln	Lys	Val	Asp	Ala	Glu	Glu	Tyr	Ala	Leu	
465					470					475					480	
Glu	Ala	Lys	Ile	Ala	Glu	Leu	Glu	Tyr	Glu	Val	Gln	Arg	Leu	Glu	Lys	
				485					490					495		
Glu	Leu	Lys	Glu	Ile	Asp	Glu	Ser	Asp	Ser	Glu	Asp	Tyr	Leu	Lys	Glu	
			500					505					510			



Gly Leu Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys  
 515 520 525  
 Leu Ser Lys Leu Glu Glu Leu Ser Asp Lys Ile Asp Glu Leu Asp Ala  
 530 535 540  
 Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly Asn Asn  
 545 550 555 560  
 Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr Ala Glu  
 565 570 575  
 Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Leu Lys Lys Ala Val  
 580 585 590  
 Asp Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln Pro Ala Pro Ala Pro  
 595 600 605  
 Glu Lys Pro Ala Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro  
 610 615 620  
 Ala Pro Ala Pro Glu Lys Pro Ala Glu Lys Pro Ala Glu Lys Pro Ala  
 625 630 635 640  
 Glu Glu Pro Ala Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro  
 645 650 655  
 Thr Pro Glu Lys Pro Ala Pro Thr Pro Glu Thr Pro Lys Thr  
 660 665 670

<210> 64  
 <211> 437  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 64  
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
 1 5 10 15  
 Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly  
 20 25 30  
 Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr  
 35 40 45  
 Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val  
 50 55 60  
 Val Asp Glu Tyr Ile Glu Lys Met Leu Ser Glu Ile Gln Leu Asp Arg  
 65 70 75 80  
 Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile  
 85 90 95  
 Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys  
 100 105 110

Asp	Glu	Leu	Pro	Ser	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	115	120	125
Leu	Glu	Ile	Ala	Glu	Phe	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	130	135	140
Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys	145	150	155
Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	165	170	175
Glu	Asn	Glu	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	180	185	190
Arg	Lys	Ala	Asp	Gly	Lys	Leu	Lys	Glu	Ala	Asn	Val	Ala	Thr	Ser	Asp	195	200	205
Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	210	215	220
Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	225	230	235
Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Ser	Ser	Leu	Lys	Ser	Gly	Lys	Lys	245	250	255
Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	260	265	270
Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	275	280	285
Thr	Leu	Asp	Glu	Leu	Glu	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	290	295	300
Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	305	310	315
Lys	Ile	Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	325	330	335
Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	340	345	350
Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	355	360	365
Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Glu	Lys	Pro	Ala	Pro	370	375	380
Lys	Pro	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp	385	390	395
Gln	Gln	Ala	Glu	Glu	Asp	Tyr	Ala	Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	405	410	415

Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro  
 420 425 430

Ser Thr Pro Lys Thr  
 435

<210> 65

<211> 478

<212> PRT

<213> Streptococcus pneumoniae

<400> 65

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
 1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly  
 20 25 30

Gly Val Val His Ala Glu Gly Val Arg Ser Glu Asn Thr Pro Val Thr  
 35 40 45

Ser Ser Gly Asp Glu Val Asp Glu Tyr Ile Lys Lys Met Leu Ser Glu  
 50 55 60

Ile Gln Leu Asp Lys Arg Lys His Thr His Asn Phe Ala Leu Asn Leu  
 65 70 75 80

Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Tyr Lys Leu Lys Val Asn  
 85 90 95

Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Thr Ser Lys Thr Lys Lys  
 100 105 110

Glu Val Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Leu Lys Leu  
 115 120 125

Gly Glu Lys Val Ala Glu Ala Gln Lys Lys Val Glu Glu Ala Lys Lys  
 130 135 140

Lys Ala Lys Asp Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr Asn  
 145 150 155 160

Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys Val  
 165 170 175

Lys Glu Ala Glu Leu Glu Leu Leu Lys Glu Glu Ala Lys Thr Arg Asn  
 180 185 190

Glu Asp Thr Ile Asn Gln Ala Lys Ala Lys Val Lys Ser Glu Gln Ala  
 195 200 205

Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Gln Ala Glu  
 210 215 220

Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu

225                      230                      235                      240  
 Ala Lys Arg Lys Ala Glu Ala Glu Glu Val Lys Asp Lys Leu Lys Arg  
                                  245                                   250                                   255  
 Arg Thr Lys Arg Ala Val Pro Gly Glu Pro Ala Thr Pro Asp Lys Lys  
                                  260                                   265                                   270  
 Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu  
                                  275                                   280                                   285  
 Pro Ser Pro Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Gln Lys  
                                  290                                   295                                   300  
 Lys Val Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp  
 305                                   310                                   315                                   320  
 Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ala  
                                  325                                   330                                   335  
 Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu  
                                  340                                   345                                   350  
 Glu Ala Lys Glu Ser Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala  
                                  355                                   360                                   365  
 Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys  
                                  370                                   375                                   380  
 Thr Asp Arg Lys Lys Ala Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu  
 385                                   390                                   395                                   400  
 Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Glu Lys Pro Thr Glu  
                                  405                                   410                                   415  
 Glu Pro Glu Asn Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu  
                                  420                                   425                                   430  
 Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr  
                                  435                                   440                                   445  
 Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro  
                                  450                                   455                                   460  
 Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr  
 465                                   470                                   475

<210> 66  
 <211> 487  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 66  
 Met Phe Ala Ser Lys Asn Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
   1                                   5                                   10                                   15

Phe	Ser	Ile	Gly	Val	Ala	Ser	Val	Ala	Val	Ala	Ser	Leu	Phe	Met	Gly	20	25	30	
Ser	Val	Val	His	Ala	Thr	Glu	Lys	Glu	Val	Thr	Thr	Gln	Val	Ala	Thr	35	40	45	
Ser	Phe	Asn	Lys	Ala	Asn	Lys	Ser	Gln	Thr	Glu	His	Met	Lys	Ala	Ala	50	55	60	
Lys	Gln	Val	Asp	Glu	Tyr	Ile	Thr	Lys	Lys	Leu	Gln	Leu	Asp	Arg	Arg	65	70	75	80
Lys	His	Thr	Gln	Asn	Val	Gly	Leu	Leu	Thr	Lys	Leu	Gly	Val	Ile	Lys	85	90	95	
Thr	Glu	Tyr	Leu	His	Arg	Leu	Ser	Val	Ser	Lys	Glu	Lys	Ser	Glu	Ala	100	105	110	
Glu	Leu	Pro	Ser	Glu	Ile	Lys	Ala	Lys	Leu	Asp	Ala	Ala	Phe	Glu	Gln	115	120	125	
Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Gly	Lys	Lys	Val	Ala	Glu	130	135	140	
Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	145	150	155	160
Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	165	170	175	
Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	180	185	190	
Leu	Val	Lys	Glu	Glu	Ala	Lys	Gly	Ser	Arg	Asn	Glu	Gln	Lys	Val	Asn	195	200	205	
Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	210	215	220	
Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Glu	225	230	235	240
Asn	Ile	Lys	Thr	Asp	Arg	Glu	Lys	Ala	Glu	Glu	Ala	Lys	Arg	Lys	Ala	245	250	255	
Glu	Ala	Glu	Glu	Val	Lys	Asp	Lys	Leu	Lys	Arg	Arg	Thr	Lys	Arg	Ala	260	265	270	
Val	Pro	Gly	Glu	Pro	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	275	280	285	
Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	290	295	300	
Lys	Ser	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	305	310	315	320

Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
 325 330 335  
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ala Glu Ser Asp Val Lys  
 340 345 350  
 Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser  
 355 360 365  
 Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys  
 370 375 380  
 Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys  
 385 390 395 400  
 Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu  
 405 410 415  
 Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys  
 420 425 430  
 Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala  
 435 440 445  
 Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr Ala Arg Arg Ser  
 450 455 460  
 Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu  
 465 470 475 480  
 Lys Pro Ala Gln Pro Ser Thr  
 485

<210> 67  
 <211> 451  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 67  
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
 1 5 10 15  
 Phe Ser Val Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly  
 20 25 30  
 Ser Val Val His Ala Thr Glu Asn Glu Gly Ala Thr Gln Val Pro Thr  
 35 40 45  
 Ser Ser Asn Arg Ala Asn Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro  
 50 55 60  
 Lys Lys Leu Asp Ser Glu Arg Asp Lys Ala Arg Lys Glu Val Glu Glu  
 65 70 75 80  
 Tyr Val Lys Lys Ile Val Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys  
 85 90 95

Arg	His	Thr	Ile	Thr	Val	Ala	Leu	Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	100	105	110
Asn	Glu	Tyr	Leu	Asn	Lys	Ile	Val	Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	115	120	125
Gln	Ile	Leu	Met	Met	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	130	135	140
Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	145	150	155
Leu	Val	Lys	Val	Lys	Ala	Asn	Glu	Pro	Arg	Asp	Glu	Gln	Lys	Ile	Lys	165	170	175
Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	180	185	190
Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Glu	Glu	Glu	Ala	Lys	Arg	195	200	205
Arg	Ala	Asp	Ala	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	210	215	220
Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	225	230	235
Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	245	250	255
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	260	265	270
Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	275	280	285
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ala	Glu	Ser	Asp	Val	290	295	300
Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	305	310	315
Pro	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu	Ser	325	330	335
Lys	Lys	Ala	Glu	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	340	345	350
Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	355	360	365
Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	370	375	380
Pro	Ala	Pro	Ala	Pro	Lys	Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Lys	Pro	385	390	395

Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln  
                             405                            410                            415  
 Ala Glu Glu Glu Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu  
                             420                            425                            430  
 Thr Leu Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr  
                             435                            440                            445  
 Pro Lys Thr  
                             450

<210> 68  
 <211> 730  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 68  
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys  
   1                            5                            10                            15  
 Phe Ser Ile Gly Val Ala Ser Val Val Val Ala Ser Leu Phe Leu Gly  
                             20                            25                            30  
 Gly Val Val His Ala Glu Glu Val Arg Arg Gly Asn Asn Leu Thr Val  
                             35                            40                            45  
 Thr Ser Ser Gly Asp Glu Val Glu Ser His Tyr Gln Ser Ile Leu Glu  
   50                            55                            60  
 Lys Val Arg Lys Ser Leu Glu Lys Asp Arg His Thr Gln Asn Val Asp  
   65                            70                            75                            80  
 Leu Ile Lys Lys Leu Gln Asp Ile Lys Arg Thr Tyr Leu Tyr Asn Leu  
                             85                            90                            95  
 Lys Glu Lys Pro Glu Ala Glu Leu Thr Ser Lys Thr Asn Lys Glu Leu  
                             100                            105                            110  
 Asp Ala Ala Phe Glu Lys Phe Lys Lys Glu Pro Glu Leu Thr Lys Lys  
                             115                            120                            125  
 Leu Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp His  
   130                            135                            140  
 Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Ile Glu Leu Glu Ile Ala  
  145                            150                            155                            160  
 Glu Ala Glu Val Gly Val Ala Lys Ala Glu Leu Glu Leu Ala Gln Ala  
                             165                            170                            175  
 Gln Val Gln Ile Pro Gln Asp Thr Glu Lys Ile Asn Ala Ala Lys Ala  
                             180                            185                            190  
 Lys Val Glu Ala Ala Lys Ser Asn Val Lys Lys Leu Glu Lys Ile Lys



195					200					205						
Ser	Asp	Ile	Glu	Lys	Thr	Tyr	Leu	Tyr	Lys	Leu	Asp	Asn	Ser	Thr	Lys	
210					215					220						
Glu	Thr	Pro	Lys	Ser	Arg	Val	Arg	Arg	Asn	Ser	Pro	Gln	Val	Gly	Asp	
225					230					235					240	
Ser	Arg	Glu	Leu	Lys	Glu	Thr	Ile	Asp	Lys	Ala	Lys	Glu	Thr	Leu	Ser	
245					250					255						
Thr	Tyr	Met	Val	Thr	Arg	Leu	Thr	Lys	Leu	Asp	Pro	Ser	Val	Phe	Trp	
260					265					270						
Phe	Ala	Asp	Leu	Leu	Met	Asp	Ala	Lys	Lys	Val	Val	Glu	Glu	Tyr	Lys	
275					280					285						
Thr	Lys	Leu	Glu	Asp	Ala	Ser	Asp	Lys	Lys	Ser	Val	Glu	Asp	Leu	Arg	
290					295					300						
Lys	Glu	Ala	Glu	Gly	Lys	Ile	Glu	Ser	Leu	Ile	Val	Thr	His	Gln	Asn	
305					310					315					320	
Arg	Glu	Lys	Glu	Asn	Gln	Pro	Ala	Pro	Gln	Pro	Gly	Gly	Gln	Ala	Gly	
325					330					335						
Gly	Ser	Met	Val	Val	Pro	Pro	Val	Thr	Gln	Thr	Pro	Pro	Ser	Thr	Ser	
340					345					350						
Gln	Ser	Pro	Gly	Gln	Lys	Ala	Thr	Glu	Ala	Glu	Lys	Lys	Lys	Leu	Gln	
355					360					365						
Asp	Leu	Ile	Arg	Gln	Phe	Gln	Glu	Ala	Leu	Asn	Lys	Leu	Asp	Asp	Glu	
370					375					380						
Thr	Lys	Thr	Val	Pro	Asp	Gly	Ala	Lys	Leu	Thr	Gly	Glu	Ala	Gly	Lys	
385					390					395					400	
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<211> 2349

<212> DNA

<213> Streptococcus pneumoniae

<400> 69

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<211> 2405

<212> DNA

<213> *Streptococcus pneumoniae*

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<212> DNA

<213> Streptococcus pneumoniae

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<400> 71

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<213> Streptococcus pneumoniae

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ccaaccatta	cttacaaaac	gcttgaactt	gaaattgctg	agtccgatgt	ggaagttaaa	780
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aaccaagcaa	aagcgaaaag	tgagagtaaa	caagctgagg	ctacaagggt	aaaaaaaaatc	900
aagacagatc	gtgaacaagc	tgagactaca	aggttagaaa	acatcaagac	agatcgtgaa	960
aaagcagaag	aagctaaacg	aaaagcagat	gctaaagagc	aagatgaatc	aaagaggcgg	1020
gtaaaaggag	gagttccggg	agagcaagca	acacttgata	aaaaagaaaa	tgatgcgaag	1080
tcttcagatt	ctagcgtagg	tgaagaaact	cttccaagcc	catccctgaa	atcaggaaaa	1140
aaggtagcag	aagctgagaa	gaagggttgc	gaagctgaga	aaaaagccaa	ggatcaaaaa	1200
gaagaagatc	gccgtactaa	cccaaccaat	acttacaaaa	cgcttgaact	tgaaattgct	1260
gagtcggatg	tgaaagttaa	agaagcggag	cttgaactag	taaaagagga	agctaaggaa	1320
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gctacaaggt	tagaaaaaat	caagacagat	cgtaaaaaag	cagaagaagc	taaacgaaaa	1440
gcagcagaag	aagataaagt	taaagaaaaa	ccagctgaac	aaccacaacc	agcgccggct	1500
cctcaaccag	aaaaaccagc	tccagctcca	aaaccagaga	atccagctga	acaacaaaaa	1560

gcagaaaaac cagctgatca acaagctgaa gaagactatg ctcgtagatc agaagaagaa 1620  
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<210> 74  
 <211> 1766  
 <212> DNA  
 <213> Streptococcus pneumoniae

<220>  
 <221> misc\_feature  
 <222> (1)..(1766)  
 <223> nucleotide "n" can be any of the nucleotides "a",  
 "c", "g" or "t".

<400> 74  
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 ggaagcataa agagataaat acaaaattcg atttatatac agttcatatt gaagtgatat 180  
 agtaagggtta aagaaaaaat atagaaggaa ataaacatgt ttgcatcaaa aagcgaagaa 240  
 aaagtacatt attcaattcg taaatttagt gttggagtag ctagtgtagt tgttgccagt 300  
 cttgttatgg gaagtgtggt tcatgacgaca gagaacgagg gagctaccca agtaccact 360  
 tcttctaata gggcaaatga aagtcaggca gaacaaggag aacaacctaa aaaactcgat 420  
 tcagaacgag ataaggcaag gaaagaggtc gaggaatatg taataaaaaat agtgggtgag 480  
 agctatgcaa aatcaactaa aaagcgacat acaattactg tagctctagt taacgagttg 540  
 aacaacatta agaacgagta tttgaataaa atagttgaat caacctcaga aagccaacta 600  
 cagatactga tgatggagag tcgatcaaaa gtagatgaag ctgtgtctaa gtttgaaaag 660  
 gactcatctt cttcgtcaag ttcagactct tccactaaac cggaagcttc agatacagcg 720  
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 gaagctgaga aaaaagccaa ggatcaaaaa gaagaagatc gtcgtaacta cccaaccatt 840  
 acttcaaaaa cgcttgaact tgaaattgct gagtccgatg tggaagttaa aaaagcggag 900  
 cttgaactag taaaagttaa agctaacgaa cctcgagacg agcaaaaaat taagcaagca 960  
 gaagcgggaag ttgagagtaa acaagctgag gctacaaggt taataaaaaat caagacagat 1020  
 cgtgaagaag cagaagaaga agctaaacga agagcagatg ctaaagagca aggtaaacca 1080  
 aaggggcggg caaaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaat 1140  
 gatgcgaagt cttcagattc tagcgtaggt gaagaaactc ttccaagccc atccctgaaa 1200  
 ccagaaaaaa aggttagcaga agctgagaag aaggttgaag aagctaagaa aaaagccgag 1260  
 gatcaaaaaa aagaagatcg ccgtaaactac ccaaccaata cttacaaaac gcttgaactt 1320  
 gaaattgctg agtccgatgt ggaagttaaa aaagcggagc ttgaactagt aaaagaggaa 1380  
 gctaaggaac ctcgaaacga ggaaaaagtt aagcaagcaa aagcggagat tgagagtaaa 1440  
 aaagctgagg ctactagggt agaaaaaatc aagacagatc gtaaaaaagc agaagaagaa 1500  
 gctaaacgaa aagcagcaga agaagataaa gttaaagaaa aaccagctga acaaccacaa 1560  
 ccagcgcggg ctccaaaagc agaaaaacca gctccagctc caaaaccaga gaatccagct 1620  
 gaacaaccaa aagcagaaaa accagctgat caacaagctg aagaagagta tgctcgtaga 1680  
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 caaccatcta ctccaaaaac aanac 1766

<210> 75  
 <211> 1590  
 <212> DNA  
 <213> Streptococcus pneumoniae

<400> 75  
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 ataattatgt ttgcatcyaa aagcgaagaa aaagtacatt attcaattcg taaatttagt 180

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ataaaaaaaaa tgttgagtga gatccaatta gataaaagaa aacataccca caatttcgcc 360
ttaaacctaa agttgagcag aattaaaacg gagtatttgt ataaattaaa agttaatgtt 420
ttagaagaaa agtcaaaaagc tgagttgacg tcaaaaacaa aaaaagaggt agacgcagct 480
tttgagaagt ttaaaaaaga tacattgaaa ctaggagaaa aggtagcaga agctcagaag 540
aaggttgaag aagctaagaa aaaagccaag gatcaaaaag aagaagatca ccgtaactac 600
ccaaccaata cttacaaaac gcttgaactt gaaattgctg agtccgatgt gaaagttaaa 660
gaagcggagc ttgaactatt gaaagaggaa gctaaaactc gaaacgagga cacaattaac 720
caagcaaaag cgaaaagttaa gagtgaacaa gctgaggcta caaggttaaa aaaaatcaag 780
acagatcgtg aacaagctga ggctacaagg ttagaaaaca tcaagacaga tcgtgaaaaa 840
gcagaagaag ctaaacgaaa agcagaagca gaagaagtta aagataaact aaagaggcgg 900
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tctcgaaacg aggaaaaagt taagcaagca aaagcgaaag ttgagagtaa aaaagctgag 1260
gctacaaggt tagaaaaaat caagacagat cgtaaaaaag cagaagaagc taaacgaaga 1320
gcagcagaag aagataaagt taaagaaaaa ccagctgaac aaccacaacc agcgccggct 1380
cctcaaccag aaaaaccaac tgaagagcct gagaatccag ctccagctcc aaaacctgag 1440
aatccagctg aacaaccaaa agcagaaaaa ccagctgatc aacaagctga agaagactat 1500
gctcgtagat cagaagaaga atataatcgc ttgactcaac agcaaccgcc aaaaactgaa 1560
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<210> 76

<211> 19

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer

<400> 76

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19

<210> 77

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer

<400> 77

cataccgttt tcttgtttcc agcc

24

<210> 78

<211> 70

<212> PRT

<213> Streptococcus pneumoniae

<400> 78

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys



1

5

10

15

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Gly Val Val His Ala Glu Gly Val Arg Gly Ile Thr Gln Ser Gly Asn  
35 40 45

Asn Leu Thr Val Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys Tyr Ala  
50 55 60

Asp Glu Val Glu Ser Pro  
65 70